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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/811,069	03/26/2004	Bruce Douglas Smith	UTSJ:045US	8075

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EXAMINER

POLYZOS, FAYE S

ART UNIT	PAPER NUMBER
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2884

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Please find below and/or attached an Office communication concerning this application or proceeding.

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Office Action Summary	Application No. 10/811,069	Applicant(s) SMITH, BRUCE DOUGLAS	
	Examiner Faye Polyzos	Art Unit 2884	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 26 March 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-39 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-39 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>7/16/04</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-11, 15-22 and 25-36 are rejected under 35 U.S.C. 102(b) as being anticipated by *Gullberg et al* (US 5,841,141 A).

Regarding claim 1, Gullberg discloses a method, comprising: determining an apex of a cone from a trajectory (i.e. rays) of a photon emitted from an object to a point of intersection (x') on a first detector (30a); determining an axis of symmetry of the cone from the point of intersection on the first detector and a point of intersection (x'') on a second detector (30b); using a finite set of integrals dependent on the apex of the cone and the axis of symmetry of the cone to satisfy a completeness condition and using the finite set of integrals for image reconstruction (See Generally Figs. 2A-2B and col. 3, lines 60-67 and col. 4, lines 1-42).

Regarding claim 2, Gullberg discloses the apex of the cone comprising the point of intersection (x') on the first detector (30a) (See Generally Figs. 2A-2B and col. 4, lines 6-20).

Regarding claim 3, Gullberg discloses the axis of symmetry comprising determining a scatter angle of the photon from the first detector onto the second detector (See Generally Figs. 2A-2B and col. 3, lines 60-67 and col. 4, lines 1-5).

Regarding claim 4, Gullberg discloses the scatter angle ranging from 0-180 degrees (See Generally Figs. 2A-2B and col. 3, lines 60-67 and col. 4, lines 1-5).

Regarding claim 5, Gullberg discloses determining a half-angle of a cone, the half-angle of the cone comprising the scatter angle of the photon (See Generally Figs. 2A-2B and col. 3, lines 34-51).

Regarding claim 6, Gullberg discloses the step of calculating providing transformation (i.e. Hilbert) on partial derivatives of a three-dimensional Radon transform (col. 5, lines 8-16 and lines 8-15 and lines 34-58).

Regarding claim 6, Gullberg discloses the step of calculating providing transformation (i.e. Hilbert) on partial derivatives of a three-dimensional Radon transform (col. 5, lines 8-16 and lines 34-58).

Regarding claims 7-8, Gullberg discloses the finite set of integrals of the cone comprising computing surface integrals of the cone and line integrals of the cone (See Generally Figs. 2A-2B and col. 4, lines 44-67 and col. 1-15).

Regarding claim 9, Gullberg discloses the image reconstruction comprising implementing a two-step reconstruction method (col. 7, lines 30-44).

Regarding claims 10-11, Gullberg discloses the object comprising a patient (i.e. human or animal) (col. 1, lines 18-30).

Regarding claim 15, Gullberg discloses a method for image reconstruction, comprising: calculating a set of conical integrals to satisfy a completeness condition; and relating the set of conical integrals to a distribution of radioactivity (col. 5, lines 34-58).

Regarding claim 16, Gullberg discloses defining a cone from a trajectory of a photon from an object through a first detector and second detector (See Generally Figs. 2A-2B and col. 3, lines 60-67 and col. 4, lines 1-42).

Regarding claim 17, Gullberg discloses the step of defining a cone comprising determining an apex, an axis of symmetry, and a half-angle of the cone (See Generally Figs. 2A-2B and col. 3, lines 34-51 and lines 60-67 and col. 4, lines 1-52).

Regarding claims 18-19, Gullberg discloses the set of conical integrals comprising surface integrals and line integrals (See Generally Figs. 2A-2B and col. 4, lines 44-67 and col. 1-15).

Regarding claim 20, Gullberg discloses the method further comprising calculating a transformation (i.e. Hilbert) on partial derivatives of a three-dimensional Radon transformation (col. 5, lines 8-16 and lines 34-58).

Regarding claims 21-22, Gullberg discloses the step of relating further comprising reconstructing an image and implementing a two-step reconstruction method (col. 4, lines 44-67, col. 5, lines 1-15 and col. 7, lines 30-44).

Regarding claim 25, Gullberg discloses a method for image reconstruction, comprising: calculating a set of integrated line integrals to satisfy a completeness condition; and relating the set of integrated line integrals to a distribution of radioactivity (See Generally Figs. 2A-2B and col. 4, lines 44-67 and col. 1-15).

Regarding claim 26, Gullberg discloses a method for image reconstruction, comprising: calculating a set of surface integrals to satisfy a completeness condition;

Art Unit: 2884

and relating the set of surface integrals to a distribution of radioactivity (See Generally Figs. 2A-2B and col. 4, lines 44-67 and col. 1-15).

Regarding claim 27, Gullberg discloses a computer readable medium comprising instructions for: calculating a set of conical integrals to satisfy a completeness condition; and relating the set of conical integrals to a distribution of radioactivity (col. 5, lines 11-33).

Regarding claim 28, Gullberg discloses the computer readable medium further comprising instructions for determining an apex and an axis of symmetry of a cone (See Generally Figs. 1 and 2A-2B and col. 3, lines 34-51 and lines 60-67; col. 4, lines 1-52 and col. 5, lines 11-33).

Regarding claim 29, Gullberg discloses the computer readable medium further comprising instructions for calculating transforms (i.e. Hilbert) on partial derivatives of a three-dimensional Radon transform of the cone on the set of conical integrals (col. 5, lines 8-16 and lines 34-58).

Regarding claims 30-31, Gullberg discloses the computer readable medium, the set of conical integrals comprising surface integrals and integrated line integrals (See Generally Figs. 2A-2B and col. 4, lines 44-67 and col. 1-15).

Regarding claim 32, Gullberg discloses the computer readable medium further comprising instructions for implementing a two-step image reconstruction (col. 7, lines 30-44).

Regarding claim 33, Gullberg discloses a system, comprising: a Compton camera (14); at least two detectors coupled to the camera, the at least two-detectors

Art Unit: 2884

(30a)(30b) configured to obtain conical data to satisfy a completeness condition (See Generally Figs. 2A-2B and col. 3, lines 60-67 and col. 4, lines 1-42).

Regarding claim 34, Gullberg discloses the camera being configured to move along a sine-on-cylinder curve (See Generally Figs. 1 and 2A-2B).

Regarding claim 35, Gullberg discloses the camera being configured to move along a circular path (See Generally Figs. 1 and 2A-2B).

Regarding claim 36, Gullberg discloses the at least two detectors (30a)(30b) comprising planar detectors (See Generally Figs. 2A-2B and col. 3, lines 60-64).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 12-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Gullberg et al (US 5,841,141 A)* as applied to claim 1 above, and further in view of *Weinberg et al (US 6,628,984 B2)*

Regarding claims 12-14, Gullberg discloses an image reconstruction method wherein the object comprising a patient (i.e. human or animal) (col. 1, lines 18-30). Gullberg does not specifically disclose of the object comprising a nuclear facility or waste site or missiles. Weinberg discloses of an image reconstruction method wherein the object comprising radioactive waste (i.e. nuclear facility, missile or nuclear waste site (col. 11, lines 66-67 and col. 12, lines 1-6). Weinberg teaches position-integrating

technology is in the surveillance of radioactive waste. There is a need for a method to describe the distribution (in three dimensions) of radioactive materials generated by, for example, a nuclear power station. These materials are occasionally buried underground as nuclear waste (col. 11, lines 66-67 and col. 12, lines 1-6). Therefore, it would have been obvious to modify the method suggested by Gullberg, to include the objects of radioactive waste, as disclosed supra by Weinberg, to allow for a more versatile method of image reconstruction.

5. Claims 23-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Gullberg et al* (US 5,841,141 A) as applied to claim 21 above, and further in view of *Schwartz et al* ("*Lamb wave tomographic imaging system for aircraft structural health assessment*").

Regarding claims 23-24, Gullberg discloses of reconstruction techniques such as filtered back projection algorithm (col. 5, lines 8-33). Gullberg does not disclose of ART-like, SIRT-like or ML-EM reconstruction methods. Schwartz discloses an image reconstruction method wherein the step of reconstruction comprising an ART-like, a SIRT-like or ML-EM reconstruction method (page 2, paragraphs 1 and 2). Schwartz teaches algorithms for Lamb wave tomography have been evaluated based on imaging configuration using algebraic reconstruction techniques (ART) and the simultaneous iterative reconstruction technique (SIRT). ART is a ray-by-ray iterative technique that applies corrections as each ray is processed, whereas SIRT applies corrections only after all rays have been examined. We find that the ART can provide an Efficient method that would be suitable for real-time image reconstruction during inspection of a

large area such that the inspector would be able to make a yes/no decision on the potential presence of a flaw. The SIRT, on the other hand, has a better convergence behavior and appears to be best suited for the analysis of defect characteristics once a flaw has been detected (page 2, paragraphs 2). Therefore, it would have been obvious to modify the method suggested by Gullberg to include reconstruction methods, such as; ART-like, a SIRT-like or ML-EM, as disclosed supra by Schwartz, to allow for a more versatile apparatus.

6. Claims 37-39 are rejected under 35 U.S.C. 103(a) as being unpatentable over *Gullberg et al (US 5,841,141 A)* as applied to claim 33 above, and further in view of *Engdahl et al (US 5,175,434 A)*.

Regarding claims 37-39, Gullberg discloses the at least two detectors (30a)(30b) comprising planar detectors (See Generally Figs. 2A-2B and col. 3, lines 60-64). Gullberg does not disclose of spherical-shaped detector or a cylindrical detector. Engdahl discloses Compton scatter camera for nuclear medial imaging wherein the system comprises spherical-shaped detectors and cylindrical shaped detectors (col. 5, lines 37-64). Engdahl teaches the detector (10a) is preferably disk shaped, but may be of any equivalent shape such as square, rectangular, oval or the like and the second detector is preferably cylindrical in shape, but may be of any equivalent shape such as square, elliptical, circular or the like. The only requirement being that the detecting surface of the second detector surround or envelope the first detector in order to detect scattered photons from the first detector in any direction around the periphery (col. 5, lines 30-47). Therefore, it would have been obvious to modify the system suggested by

Art Unit: 2884

Gullberg, to allow for spherical and cylindrical detectors, as disclosed supra by Engdahl, to allow for a more versatile system.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Faye Polyzos whose telephone number is 571-272-2447. The examiner can normally be reached on Monday thru Friday from 7:30 AM to 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dave Porta can be reached on 571-272-2444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

9. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

FP

OTILIA GABOR
PRIMARY EXAMINER

